Name ________________ **Gas Law Review** Date ____________________

1. According to the kinetic molecular theory for an ideal gas, all gas particles

   A) are in random, constant, straight-line motion
   B) are separated by very small distances relative to their sizes
   C) have strong intermolecular forces
   D) have collisions that decrease the total energy of the system

2. Under which conditions of temperature and pressure does a real gas behave most like an ideal gas?

   A) low temperature and low pressure
   B) low temperature and high pressure
   C) high temperature and low pressure
   D) high temperature and high pressure

3. A sample of chlorine gas is at 300. K and 1.00 atmosphere. At which temperature and pressure would the sample behave more like an ideal gas?

   A) 0 K and 1.00 atm
   B) 150. K and 0.50 atm
   C) 273 K and 1.00 atm
   D) 600. K and 0.50 atm

4. According to the kinetic molecular theory, which statement describes the particles of an ideal gas?

   A) The gas particles are arranged in a regular pattern.
   B) The force of attraction between the gas particles is strong.
   C) The gas particles are hard spheres in continuous circular motion.
   D) The collisions of the gas particles may result in the transfer of energy.

5. According to the kinetic molecular theory, the particles of an ideal gas

   A) have no potential energy
   B) have strong intermolecular forces
   C) are arranged in a regular, repeated geometric pattern
   D) are separated by great distances, compared to their size

6. Which statement describes the particles of an ideal gas?

   A) The particles move in well-defined, circular paths.
   B) When the particles collide, energy is lost.
   C) There are forces of attraction between the particles.
   D) The volume of the particles is negligible.

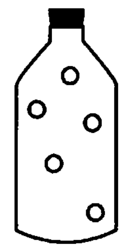
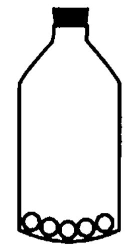
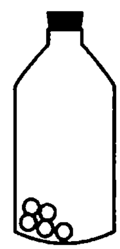
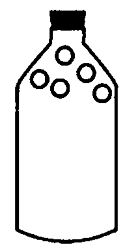
7. Standard pressure is equal to

   A) 1 atm
   B) 1 kPa
   C) 273 atm
   D) 273 kPa

8. According to the kinetic molecular theory, the molecules of an ideal gas

   A) have a strong attraction for each other
   B) have significant volume
   C) move in random, constant, straight-line motion
   D) are closely packed in a regular repeating pattern

9. Which diagram best represents a gas in a closed container?

   A)
   
   B)
   
   C)
   
   D)
   

10. The concept of an ideal gas is used to explain

    A) the mass of a gas sample
    B) the behavior of a gas sample
    C) why some gases are monatomic
    D) why some gases are diatomic

11. An assumption of the kinetic theory of gases is that the particles of a gas have

    A) little attraction for each other and a significant volume
    B) little attraction for each other and an insignificant volume
    C) strong attraction for each other and a significant volume
    D) strong attraction for each other and an insignificant volume

12. A real gas behaves *least* like an ideal gas under the conditions of

    A) low temperature and low pressure
    B) low temperature and high pressure
    C) high temperature and low pressure
    D) high temperature and high pressure

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13. A real gas behaves more like an ideal gas when the gas molecules are

    A) close and have strong attractive forces between them
    B) close and have weak attractive forces between them
    C) far apart and have strong attractive forces between them
    D) far apart and have weak attractive forces between them

14. Which gas is *least* likely to obey the ideal gas laws at very high pressures and very low temperatures?

    A) He B) Ne C) Kr **D) Xe**

15. Under the same conditions of temperature and pressure, which of the following gases would behave most like an ideal gas?

    A) He(g) B) NH_3(g)
    C) Cl_2(g) D) CO_2(g)

16. Which two samples of gas at STP contain the same total number of molecules?

    A) 1 L of CO(g) and 0.5 L of N_2(g)
    B) 2 L of CO(g) and 0.5 L of NH_3(g)
    C) 1 L of H_2(g) and 2 L of Cl_2(g)
    D) 2 L of H_2(g) and 2 L of Cl_2(g)

17. The table below shows data for the temperature, pressure, and volume of four gas samples.

Data for Four Gas Samples

Gas Sample	Temperature (K)	Pressure (atm)	Volume (mL)
A	100.	2	400.
B	200.	2	200.
C	100.	2	400.
D	200.	4	200.

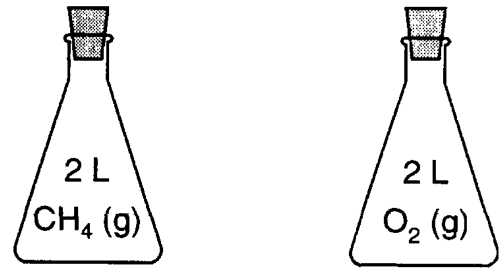
Which two gas samples have the same total number of molecules?

A) *A* and *B* **B) *A* and *C***
C) *B* and *C* D) *B* and D

18. A 220.0-mL sample of helium gas is in a cylinder with a movable piston at 105 kPa and 275 K. The piston is pushed in until the sample has a volume of 95.0 mL. The new temperature of the gas is 310. K. What is the new pressure of the sample?

    A) 51.1 kPa B) 216 kPa
    C) 243 kPa **D) 274 kPa**

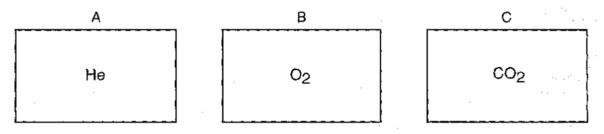
19. Each stoppered flask below contains 2 liters of a gas at STP.



Each gas sample has the same

A) density B) mass
C) number of molecules D) number of atoms

20. The diagrams below represent three 1-liter containers of gas, *A*, *B*, and *C*. Each container is at STP.



Which statement correctly compares the number of molecules in the containers?

A) Container *A* has the greatest number of molecules.
B) Container *B* has the greatest number of molecules.
C) Container *C* has the greatest number of molecules.
D) All three containers have the same number of molecules.

21. A cylinder with a movable piston contains a sample of gas having a volume of 6.0 liters at 293 K and 1.0 atmosphere. What is the volume of the sample after the gas is heated to 303 K, while the pressure is held at 1.0 atmosphere?

    A) 9.0 L **B) 6.2 L** C) 5.8 L D) 4.0 L

22. At which temperature is the vapor pressure of ethanol equal to the vapor pressure of propanone at 35°C?

    A) 35°C **B) 60.°C** C) 82°C D) 95°C

23. A gas occupies a volume of 444 mL at 273 K and 79.0 kPa. What is the final kelvin temperature when the volume of the gas is changed to 1880 mL and the pressure is changed to 38.7 kPa?

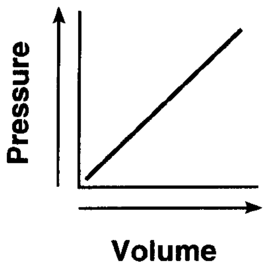
    A) 31.5 K B) 292 K
    C) 566 K D) 2360 K

24. Which temperature change would cause the volume of a sample of an ideal gas to double when the pressure of the sample remains the same?

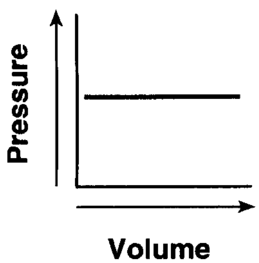
    A) from 200ºC to 400ºC B) from 400ºC to 200ºC
    C) from 200 K to 400 K D) from 400 K to 200 K

25. Which graph represents the relationship between pressure and volume for a sample of an ideal gas at constant temperature?

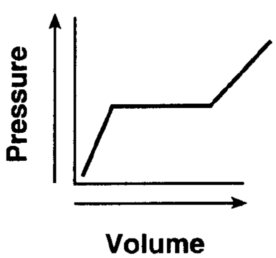
A)



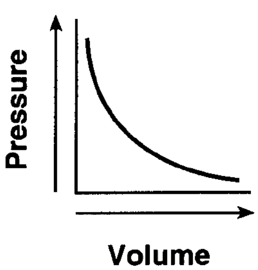
B)



C)



D)



26. A gas occupies a volume of 40.0 milliliters at 20°C. If the volume is increased to 80.0 milliliters at constant pressure, the resulting temperature will be equal to

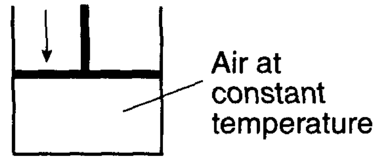
A) $20°C \times \frac{80.0 mL}{40.0 mL}$ B) $20°C \times \frac{40.0 mL}{80.0 mL}$

C) $293K \times \frac{80.0 mL}{40.0 mL}$ D) $293K \times \frac{40.0 mL}{80.0 mL}$

27. As the temperature of a given sample of a gas decreases at constant pressure, the volume of the gas

A) decreases B) increases
C) remains the same

28. A cylinder with a tightly fitted piston is shown in the diagram below.



As the piston moves downward, the number of molecules of air in the cylinder

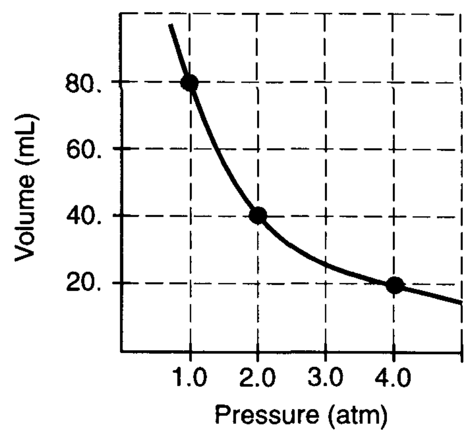
A) decreases B) increases
C) remains the same

29. Which changes in pressure and temperature occur as a given mass of gas at 50.6 kPa and 546 K is changed to STP?

A) The pressure is doubled and the temperature is halved.

B) The pressure is halved and the temperature is doubled.
C) Both the pressure and the temperature are doubled.
D) Both the pressure and the temperature are halved.

30. The graph below represents the relationship between pressure and volume of a given mass of a gas at constant temperature.

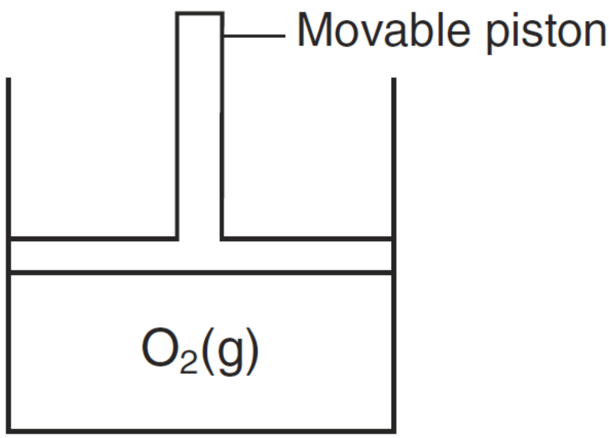


The product of pressure and volume is constant. According to the graph, what is the product in atmmL?

A) 20. B) 40. C) 60. **D) 80.**

31. Base your answer to the following question on the information below and on your knowledge of chemistry.

The diagram below represents a cylinder with a movable piston. The cylinder contains 1.0 liter of oxygen gas at STP. The movable piston in the cylinder is pushed downward at constant temperature until the volume of 0 2(g) is 0.50 liter.



State the effect on the frequency of gas molecule collisions when the movable piston is pushed farther downward into the cylinder.

32. Base your answer to the following question on the information below and on your knowledge of chemistry.

A few pieces of dry ice, $\mathrm{CO_2(s)}$, at $-78°\mathrm{C}$ are placed in a flask that contains air at $21°\mathrm{C}$. The flask is sealed by placing an uninflated balloon over the mouth of the flask. As the balloon inflates, the dry ice disappears and no liquid is observed in the flask.

Write the name of the process that occurs as the dry ice undergoes a phase change in the flask.

Base your answers to questions **33** through **35** on the information below.

A sample of helium gas is in a closed system with a movable piston. The volume of the gas sample is changed when both the temperature and the pressure of the sample are increased. The table below shows the initial temperature, pressure, and volume of the gas sample, as well as the final temperature and pressure of the sample.

Helium Gas in a Closed System

Condition	Temperature (K)	Pressure (atm)	Volume (mL)
initial	200.	2.0	500.
final	300.	7.0	?

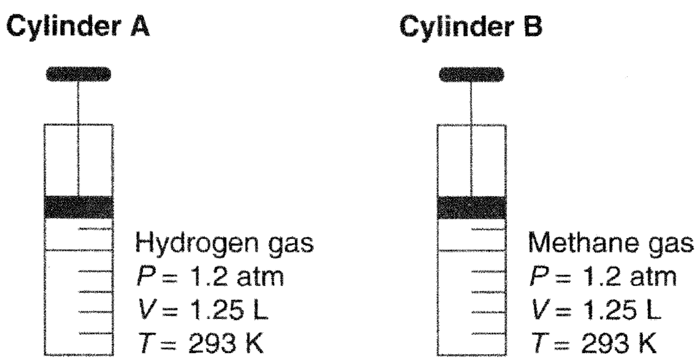
33. Compare the total number of gas particles in the sample under the initial conditions to the total number of gas particles in the sample under the final conditions.

34. Convert the final temperature of the helium gas sample to degrees Celsius.

35. In the space below show a correct numerical setup for calculating the final volume of the helium gas sample.

Base your answers to questions **36** through **38** on the information below and on your knowledge of chemistry.

Cylinder *A* has a movable piston and contains hydrogen gas. An identical cylinder, *B*, contains methane gas. The diagram below represents these cylinders and the conditions of pressure, volume, and temperature of the gas in each cylinder.



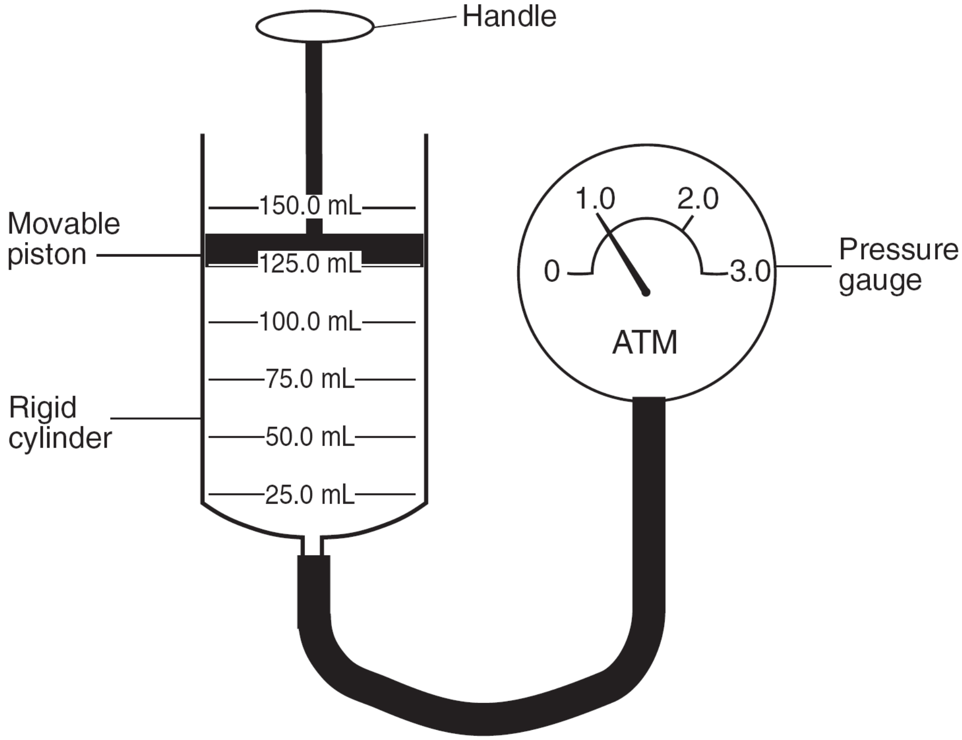
36. Show a numerical setup for calculating the volume of the gas in cylinder *B* at STP.

37. State a change in temperature and a change in pressure that will cause the gas in cylinder *A* to behave more like an ideal gas.

38. Compare the total number of gas molecules in cylinder *A* to the total number of gas molecules in cylinder *B*.

Base your answers to questions **39** through **41** on the information below.

A rigid cylinder is fitted with a movable piston. The cylinder contains a sample of helium gas, He(g), which has an initial volume of 125.0 milliliters and an initial pressure of 1.0 atmosphere, as shown below. The temperature of the helium gas sample is 20.0°C.



39. Helium gas is removed from the cylinder and a sample of nitrogen gas, $N_2(g)$, is added to the cylinder. The nitrogen gas has a volume of 125.0 milliliters and a pressure of 1.0 atmosphere at 20.0°C. Compare the number of particles in this nitrogen gas sample to the number of particles in the original helium gas sample.

40. The piston is pushed further into the cylinder. In the space below, show a correct numerical setup for calculating the volume of the helium gas that is anticipated when the reading on the pressure gauge is 1.5 atmospheres. The temperature of the helium gas remains constant.

41. Express the initial volume of the helium gas sample, in liters.

Answer Key

Flip Gas Law Review

1. A
2. C
3. D
4. D
5. D
6. D
7. A
8. C
9. A
10. B
11. B
12. B
13. D
14. D
15. A
16. D
17. B
18. D
19. C
20. D
21. B
22. B
23. C
24. C
25. D
26. C
27. A
28. C
29. A
30. D
31. –When the piston is moved farther into the cylinder, the frequency of collision between the molecules increases. –There will be more collisions per second. –increased frequency
32. –sublimation –subliming
33.
34.
35.
36. $\frac{(1.2\,\mathrm{atm})(1.25\,\mathrm{L})}{293\,\mathrm{K}} = \frac{(1.0\mathrm{atm})(V_2)}{273\,\mathrm{K}}$ $\frac{(273)(1.2)(1.25)}{293}$
37. Temperature: above 293 K Pressure : below 1.2 atm Temperature: higher Pressure: lower
38. –The number of gas molecules in cylinder *A* is the same as the number of gas molecules in cylinder *B*.
39. *Examples:* —Both samples have the same number of particles. —Equal volumes of gases at the same temperature and pressure contain the same number of particles.
40. *Examples:* —$V_2 = \frac{(1.0atm)(125.0mL)}{1.5atm}$ —(1.0)(125) = (1.50)(V_2)
41. *Examples:* — 0.1250 L —0.125 L —1.25×10^{-1} L